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A new apparatus for studying quantum gases in optical lattices¹ ULRICH SCHNEIDER, LUCIA DUCA, TRACY LI, MARTIN BOLL, PHILIPP RONZHEIMER, SIMON BRAUN, SEBASTIAN WILL, TIM ROM, MICHAEL SCHREIBER, LMU Munich, IMMANUEL BLOCH, LMU Munich MPQ Garching — We present the design of a new apparatus targeted at the study of equilibrium and out-of-equilibrium phenomena of quantum gases in 2D and 3D optical lattices. Specifically this apparatus will allow for a study of the crossover between 2D and 3D using bosonic and fermionic gases as well as Bose-Fermi mixtures. In addition we present a new analysis of previous results concerning the Fermi-Hubbard model and will analyze possible routes for creating many-body states with long range order, including antiferromagnetically ordered states and BCS-superfluids.

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Ulrich Schneider LMU Munich

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